

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (*Currently amended*) Method of analysis of analyzing ions using a quadrupole
2 ion trap having four pole rods and a field frequency Ω , the method comprising:
3 a) introducing ions into the quadrupole ion trap;
4 by radial or axial mass-to-charge selective ejection of (b) mass selectively
5 ejecting ions from an rf the quadrupole ion trap consisting of four pole rods, the
6 field having frequency Ω , wherein the ejection of ions is supported by nonlinear
7 resonances set up by superposition of by superimposing higher multipole fields
8 on the field of the ion quadrupole trap that result in nonlinear resonances; and
9 (c) detecting the ejected ions.
- 1 2. (*Currently amended*) Method according to Claim 1 wherein the ~~nonlinear~~
2 ~~resonance is produced by a superposition of higher "odd" multipole fields, and~~
3 ~~wherein the nonlinear resonance at $\Omega/3$ is used for ejection of the ions is started~~
4 by a dipolar excitation of frequency ω , where ω is an integer fraction of the
5 frequency Ω or a small multiple thereof.
- 1 3. (*Currently amended*) Method according to Claim 2 wherein higher "even"
2 ~~multipole fields are superimposed simultaneously~~ the frequency ω is equal to
3 $\Omega/3$.
- 1 4. (*Currently amended*) Method according to Claim 1 wherein the higher multipole
2 ~~fields are produced mechanically by a dislocated arrangement or unsymmetric~~
3 ~~shaping of the parallel pole rods~~ comprise higher "odd" multipole fields and/or
4 higher "even" multipole fields.

- 1 5. (*Currently amended*) Method according to Claim 4 4 wherein the higher “odd”
2 multipole fields are ~~produced by unequal amplitudes of the driving voltage at~~
3 ~~opposing pole rods~~ comprise at least a hexapole field and an octopole field.
- 1 6. (*Currently amended*) Method according to Claim 5 7 wherein ~~the ratio of the~~
2 ~~driving voltage amplitudes at opposing~~ of the additional voltages applied to pole
3 ~~rods are adjusted to the scanning rate.~~
- 1 7. (*Currently amended*) Method according to Claim 4 4 wherein the higher
2 multipole fields are ~~produced~~ generated by a dislocated dislocating the
3 arrangement of the pole rods ~~and by unequal amplitudes of the driving voltage at~~
4 ~~opposing pole.~~
- 1 8. (*Currently amended*) Method according to ~~Claims 1~~ Claim 4 wherein the ions are
2 ~~brought into nonlinear resonance by a dipolar excitation field~~ higher multipole
3 ~~fields are generated by shaping pole rods asymmetrically.~~
- 1 9. (*Currently amended*) Method according to Claim 8 4 wherein the dipolar
2 excitation field is ~~at the same frequency as the nonlinear resonance~~ higher
3 ~~multipole fields are generated by applying additional voltages of frequency Ω to~~
4 ~~the pole rods.~~
- 1 10. (*Currently amended*) Method according to Claim 9 2 wherein the phase of the
2 dipolar excitation field is locked to the phase of the ~~frequency of the driving radio~~
3 ~~frequency voltage~~ field of the ion quadrupole trap, and wherein the phases are
4 adjustable in relation to one another.
- 1 11. (*Currently amended*) Method according to Claim 1 wherein the ions are ejected
2 ~~radially through a slit in one of the pole rods~~ orthogonally and/or axially to the
3 ~~pole rods.~~

- 1 12. (*Currently amended*) Method according to Claim 1 wherein the ~~ions are ejected~~
2 axially through at least one apertured diaphragm at the end of the rod system
3 quadrupole ion trap is filled with a damping gas prior to the mass selective
4 ejection.
- 1 13. (*Currently amended*) Method according to Claim 42 2 wherein a the dipolar
2 excitation field is ~~produced~~ partially or entirely generated by splitting an apertured
3 diaphragm on the front of the ~~rod system~~ pole rods and ~~connecting one phase~~
4 ~~each of the excitation~~ applying a voltage of frequency ω to each half of the
5 diaphragm.
- 1 14. (*New*) An ion analysis apparatus comprising:
2 a quadrupole ion trap, having four pole rods and a field with a frequency
3 Ω , into which ions are introduced;
4 an ion ejection system that selectively ejects ions from the ion trap by
5 superimposing higher multipole fields on the field of the ion trap that result in
6 nonlinear resonance; and
7 a detector for detecting ions ejected from the ion trap.
- 1 15. (*New*) An ion analysis apparatus according to Claim 14 wherein the ion ejection
2 system starts ejection of the ions by a dipolar excitation of frequency ω , where ω
3 is an integer fraction of Ω or a small multiple thereof.
- 1 16. (*New*) An ion analysis apparatus according to Claim 15 wherein the frequency ω
2 is equal to $\Omega/3$.
- 1 17. (*New*) An ion analysis apparatus according to Claim 15 wherein the phase of the
2 dipolar excitation is locked to the phase of the field of the ion quadrupole trap,
3 and wherein the phases are adjustable in relation to one another.

- 1 18. (New) An ion analysis apparatus according to Claim 14 wherein the higher
2 multipole fields are generated by shaping pole rods asymmetrically.
- 1 19. (New) An ion analysis apparatus according to Claim 14 wherein the higher
2 multipole fields are generated by dislocating the arrangement of the pole rods.
- 1 20. (New) An ion analysis apparatus according to Claim 14 wherein the higher
2 multipole fields are generated by applying additional voltages of frequency Ω to
3 the pole rods.